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ABSTRACT

Standardized curricula are provided for two courses for the secondary vocational education program in Mississippi: diesel engine mechanics I and II. The eight units in diesel engine mechanics I are as follows: orientation; shop safety; basic shop tools; fasteners; measurement; engine operating principles; engine components; and basic auxiliary systems. Diesel engine mechanics II consists of seven units: orientation; advanced auxiliary systems; fuel systems; electrical systems; engine performance; hydraulics; and power trains. Each unit consists of these components: objectives, with core/essential objectives indicated; suggested instructional practices; list of suggested resources; list of evaluation and suggested minimum performance standards, with core/essential objectives indicated; and performance record, with core/essential objectives indicated. A checklist for each course combining all unit performance standards into a single list is included. (YLB)

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STANDARDIZED CURRICULUM

FOR

DIESEL ENGINE MECHANICS

MISSISSIPPI DEPARTMENT OF EDUCATION

OFFICE OF VOCATIONAL, TECHNICAL

AND ADULT EDUCATION

June 1989

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1989

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FOREWORD

This volume is intended to be used in the State of Mississippi as a mechanism for standardizing vocational education course titles and core contents. The need for standardization of curricula was triggered by provisions in the Educational Reform Act of 1982 which mandated:

-- elimination of nearly all currently existing curriculum requirements and development of new curriculum content that is "properly sequenced" and "coordinated";

-- steps to ensure that students master one level of course work before being advanced to the next level and that progression is properly sequenced;

-- a criterion-referenced, state-wide testing program that is built upon an identified set of "basic skills" keyed to student performance in grades 3, 5, 8, and 11;

-- revised graduation requirements that take into account student performance on the basic skills and also on a test of "functional literacy skills"; and

-- a system of accrediting schools that takes into account the performance of districts, schools, and students.

In addition to the mandates of the Educational Reform Act, the Strategic Plan for Vocational and Technical Education in Mississippi also calls for improving the quality of vocational and technical education through the standardization of curricula and the articulation of secondary and postsecondary programs.

Both of these mandates were further reinforced by legislation passed in 1986 which called for the establishment of state-wide "guidelines and procedures for managing an instructional program in the public schools." This legislation calls for instructional management plans containing the following components:

1. a written list of learning objectives for every course for which academic credit is given on students' transcripts (state specified core objectives must be included);

2. <u>suggested</u> instructional practices and resources for the learning objectives;

3. standards for student performance for each learning objective; and

4. systematic procedures for evaluating student performance on the learning objectives.

Specific local district actions regarding the state-wide instructional management plan are also required, namely:

1. The objectives contained in this document are common to all programs in the state. Core objectives are designated with an asterisk. The local district is encouraged to add additional objectives to this listing to meet local needs of students and employers.

2. The local school board must officially adopt the learning objectives as the district's curricula.

3. Pass/fail policies must be based on mastery of learning objectives.

4. Student performance on the learning objectives must be systematically evaluated at least once during the school year.

5. During the school year, records of individual student performance must indicate whether or not the objectives have been mastered. The record must indicate mastery status for each of the objectives tested in the Basic Skills Assessment Program (including functional literacy skills) and must be permanently maintained on all students who do <u>not</u> master the basic and functional literacy skills prior to being tested on them.

6. Each year, information about student performance on learning objectives must be reviewed. Those objectives which students are not mastering must be identified, and a plan must be developed for improving student performance on those objectives.

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DIESEL ENGINE MECHANICS I

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DIESEL ENGINE MECHANICS I

Unit No.	Title
1	Orientation
2	Shop Safety
3	Basic Shop Tools
4	Fasteners
5	Measurement
6	Engine Operating Principles
7	Engine Components
8	Basic Auxiliary Systems

COURSE: Diesel Engine Mechanics I

Unit 1: Orientation

Objectives: Upon completion of this unit, the student will:

1. Identify local school and shop policies and rules.
2. List purposes of VICA.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion

Suggested Resources:

Primary Resource: Local school student handbook
VICA Handbook

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will identify local school and shop policies and rules as determined by the local instructor.
Objective 2: The student will list four purposes of VICA.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

___ 1. Identified local school and shop policies and rules.
___ 2. Listed purposes of VICA.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics I

Unit 2: Shop Safety

Objectives: Upon completion of this unit, the student will:

*1. Identify rules of personal safety.
*2. Identify rules of general safety.
*3. Associate safety colors with their applications.
*4. Define terms associated with hazardous materials.
*5. Identify categories of hazardous materials.
*6. State signal words or symbols that indicate how severe a hazard may be.
*7. List methods for reducing hazardous waste.
*8. Identify general procedures for storing hazardous materials and wastes.
*9. Identify and describe the informational sections found on a Material Safety Data Sheet.
*10. Describe general first aid procedures to follow in case of an accident involving hazardous materials.
*11. Identify safety equipment to be used with hazardous materials.
*12. List steps to follow in handling spills and waste disposal.
*13. Identify agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Warzecha, Mary. Hazardous Materials Fingertip Retrieval System. Alexandria, VA: American Vocational Association. 1988. (Objectives 4-13)

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify five rules of personal safety.
*Objective 2: The student will identify ten rules of general safety.
*Objective 3: The student will associate five safety colors with their applications.

*Objective 4: The student will define the following terms associated with hazardous materials: hazardous material, combustible, flammable, corrosive, reactive, E P toxic.

*Objective 5: The student will identify five categories of hazardous materials.

*Objective 6: The student will state in order the five signal words or symbols that indicate how severe a hazard may be.

*Objective 7: The student will list seven methods for reducing hazardous waste.

*Objective 8: The student will identify general procedures for storing hazardous materials and wastes including the following: (a) Make sure that all containers are properly labeled at all times, (b) Mark all containers containing hazardous waste materials with the words "HAZARDOUS WASTE" and with the date that the container was first used to store the waste, (c) Store wastes and materials as described by the manufacturer, (d) Make sure that containers are intact and secure at all times, and (e) Keep all containers closed securely except when being filled or emptied.

*Objective 9: The student will identify and describe nine sections of information found on a Material Safety Data Sheet which provide guidelines for creating a safe work environment.

*Objective 10: The student will describe the following first aid procedures to be followed in case of an accident involving hazardous materials: (a) Move the victim to fresh air, (b) Check the container label, Material Safety Data Sheet, or other source for first aid procedures and begin first aid at once, (c) Contact the person designated to help with first aid and evacuation procedures, (d) Call an ambulance, (e) Follow instructions from the designated person concerning further first aid and evacuation measures, (f) Remain with the person until the ambulance arrives, and (g) Attach a Material Safety Data Sheet or other information on the material to the person's clothing prior to transport.

*Objective 11: The student will identify seven different pieces of equipment which can be used to protect the body when working with hazardous materials.

*Objective 12: The student will list seven general steps to follow in handling spills and waste disposal.

*Objective 13: The student will identify three Federal and one State agency which should be contacted in case of an accident or to obtain more information about hazardous materials.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified rules of personal safety.
____ *2. Identified rules of general safety.
____ *3. Associated safety colors to their applications.
____ *4. Defined terms associated with hazardous materials.
____ *5. Identified categories of hazardous materials.
____ *6. Stated signal words or symbols that indicate how severe a hazard may be.
____ *7. Listed methods for reducing hazardous waste.
____ *8. Identified general procedures for storing hazardous materials and wastes.
____ *9. Identified and described the informational sections found on a Material Safety Data Sheet.
____*10. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____*11. Identified safety equipment to be used with hazardous materials.
____*12. Listed steps to follow in handling spills and waste disposal.
____*13. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics I

Unit 3: Basic Shop Tools

Objectives: Upon completion of this unit, the student will:

*1. Identify basic hand tools used in a mechanics shop.
*2. Demonstrate the use of a hydraulic press.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will be able to identify 28 basic hand tools selected from the following classes: screwdrivers, hammers, pliers, wrenches, chisels and punches, and files.
*Objective 2: The student will demonstrate the use of a hydraulic press in a safe and proper manner.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified basic hand tools used in a mechanics shop.
____ *2. Demonstrated the use of a hydraulic press.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics I

Unit 4: Fasteners

Objectives: Upon completion of this unit, the student will:

*1. Identify typical fasteners used in diesel engines.
*2. Identify ways that bolts and threads are measured.
*3. Describe how SAE and metric bolts are graded.
*4. Identify special purpose nuts with locking or self-locking features.
5. List methods used to remove a seized nut.
*6. Cut internal threads.
*7. Cut external threads.
*8. Restore internal threads using a thread insert kit (Helicoil).

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify 15 typical fasteners used in diesel engines.
*Objective 2: The student will identify ways that bolts and threads are measured in terms of diameter, length, and thread size.
*Objective 3: The student will describe how SAE and metric bolts are graded in terms of tensile strength.
*Objective 4: The student will identify eight special purpose nuts with locking or self-locking features.
Objective 5: The student will list four methods used to remove a seized nut.
*Objective 6: The student will cut internal threads to specifications.
*Objective 7: The student will cut external threads to specifications.

*Objective 8: The student will restore a damaged internal thread to original specifications using a thread insert kit (Helicoil).

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified typical fasteners used in diesel engines.
____ *2. Identified ways that bolts and threads are measured.
____ *3. Described how SAE and metric bolts are graded.
____ *4. Identified special purpose nuts with locking or self-locking features.
____ 5. Listed methods used to remove a seized nut.
____ *6. Cut internal threads.
____ *7. Cut external threads.
____ *8. Restored a damaged internal thread.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics I

Unit 5: Measurement

Objectives: Upon completion of this unit, the student will:

*1. Identify tools and instruments used for measurement in diesel engine mechanics.
*2. Read a rule.
*3. Read a micrometer.
*4. Convert fractions to decimal numbers.
*5. Use an electronic calculator.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify the following tools and instruments: pocket rule, outside micrometer, inside micrometer, depth micrometer, dial indicator, standard feeler gauge, and step feeler gauge.
*Objective 2: The student will read a measurement on a pocket rule to the nearest 1/16th inch or 1 mm.
*Objective 3: The student will take and read a measurement on a micrometer to the nearest .001 inch or .01 mm.
*Objective 4: The student will be convert fractions to decimals with 100% accuracy.
*Objective 5: The student will use a simple four function electronic calculator to add, subtract, multiply, and divide with 100% accuracy.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified tools and instruments used for measurement in diesel engine mechanics.
____ *2. Read a rule.
____ *3. Read a micrometer.
____ *4. Converted fractions to decimal numbers.
____ *5. Used an electronic calculator.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics I

Unit 6: Engine Operating Principles

Objectives: Upon completion of this unit, the student will:

*1. Identify the basic parts of a diesel engine and state the function of each.
*2. List the steps in the basic operation of a diesel engine.
*3. Identify the sequence of operation of a four-stroke cycle engine.
*4. Identify the sequence of operation of a two-stroke cycle engine.
5. State differences in a two-stroke and four-stroke cycle engine.
6. State characteristics of a two-stroke and four-stroke cycle engine.
*7. State differences in diesel and gasoline engines.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Little, Richard L., and Garry C. Edmondson. Diesel Mechanics: An Introduction. North Scituate, MA: Breton Publishers. 1982. (Objective 4)

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify 15 basic parts of a diesel engine and state the function of each.
*Objective 2: The student will list three steps in the basic operation of a diesel engine.
*Objective 3: The student will identify the four strokes in the sequence of operation of a four-stroke cycle engine.
*Objective 4: The student will identify the two strokes in the sequence of operation of a two-stroke cycle engine.
Objective 5: The student will state two differences in a two-stroke and four-stroke cycle engine.

Objective 6: The student will state three characteristics of a two-stroke and three characteristics of a four-stroke cycle engine.

*Objective 7: The student will state four differences in diesel and gasoline engines.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified the basic parts of a diesel engine and stated the function of each.
____ *2. Listed the steps in the basic operation of a diesel engine.
____ *3. Identified the sequence of operation of a four-stroke cycle engine.
____ *4. Identified the sequence of operation of a two-stroke cycle engine.
____ 5. Stated differences in a two-stroke and four-stroke cycle engine.
____ 6. Stated characteristics of a two-stroke and four-stroke cycle engine.
____ *7. Stated differences in diesel and gasoline engines.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics I

Unit 7: Engine Components

Objectives: Upon completion of this unit, the student will:

*1. Identify the major parts of a cylinder head assembly.
*2. Identify primary parts of a typical valve assembly.
*3. Service a cylinder head and valve assembly.
4. Identify primary parts of a piston and connecting rod assembly.
*5. Service a piston and connecting rod assembly.
*6. Identify gears in a valve gear train which are marked to insure correct valve timing.
*7. Service a camshaft and gear train.
8. State advantages of wet and dry cylinder liners.
9. List types of crankshaft construction.
*10. Identify the parts of a crankshaft.
11. State effects of the arrangement of crankshaft throws.
12. Identify arrangement of crankshaft throws for different multi-cylinder engines.
13. List ways for maintaining crankshaft balance.
*14. State ways that bushings and bearings are used in crankshafts.
15. Identify different types of thrust bearings.
16. Identify functions of a flywheel.
*17. Service a crankshaft.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify six major parts of a cylinder head assembly.
*Objective 2: The student will identify three primary parts of a typical valve assembly.
*Objective 3: The student will remove the head; disassemble and inspect it; disassemble and service the valve train, valve guides, valve seats, and inserts; and reassemble and install the head to manufacturer's specifications.

Objective 4: The student will identify five primary parts of a piston and connecting rod assembly.

*Objective 5: The student will remove a piston and connecting rod assembly, disassemble and clean it, inspect pistons for wear, install rings, inspect the piston pin and connecting rod bushing for wear, and reinstall the piston and assembly to manufacturer's specifications.

*Objective 6: The student will identify three gears in a valve gear train which are marked to insure correct valve timing.

*Objective 7: The student will remove a camshaft and camshaft gear train, service and inspect for wear, and reinstall following manufacturer's specifications.

Objective 8: The student will state two advantages of wet cylinder liners and three advantages of dry cylinder liners.

Objective 9: The student will list three types of crankshaft construction.

*Objective 10: The student will identify five parts of a crankshaft.

Objective 11: The student will state three effects of the arrangement of crankshaft throws.

Objective 12: The student will identify three arrangement patterns for crankshaft throws for different multi-cylinder engines.

Objective 13: The student will list three ways for maintaining crankshaft balance.

*Objective 14: The student will state two ways that bushings and bearings are used in crankshafts.

Objective 15: The student will identify two different types of thrust bearings.

Objective 16: The student will identify four functions of a flywheel.

*Objective 17: The student will remove a crankshaft, inspect and measure a crankshaft and bearings, and reinstall to manufacturer's specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified the major parts of a cylinder head assembly.
____ *2. Identified primary parts of a typical valve assembly.
____ *3. Serviced a cylinder head and valve assembly.
____ 4. Identified primary parts of a piston and connecting rod assembly.
____ *5. Serviced a piston and connecting rod assembly.
____ *6. Identified gears in a valve gear train which are marked to insure correct valve timing.
____ 7. Serviced a camshaft and gear train.
____ 8. Stated advantages of wet and dry cylinder liners.
____ 9. Listed types of crankshaft construction.

____*10. Identified the parts of a crankshaft.
____ 11. Stated effects of the arrangement of crankshaft throws.
____ 12. Identified arrangement of crankshaft throws for different multi-cylinder engines.
____ 13. Listed ways for maintaining crankshaft balance.
____*14. Stated ways that bushings and bearings are used in crankshafts.
____ 15. Identified different types of thrust bearings.
____ 16. Identified functions of a flywheel.
____*17. Serviced a crankshaft.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics I

Unit 8: Basic Auxiliary Systems

Objectives: Upon completion of this unit, the student will:

1. Identify oil ratings and classifications.
2. Describe the use of an SAE viscosity number.
3. Associate the C-type engine oils with their uses.
4. Associate the GL-type gear lubricants with their uses.
*5. List functions of the lubrication system.
*6. Identify the components of a typical lubrication system and state the function of each.
*7. Change engine oil and filter.
*8. Identify parts of a liquid cooling system.
*9. Trace the flow of coolant through a liquid cooling system.
*10. Reverse flush a radiator and system.
*11. Test thermostat action.
*12. Test for exhaust gas leakage and air in the cooling system.
*13. Identify parts of an air intake system.
*14. Identify types of air cleaners.
*15. Service an air cleaner.
*16. Name types of starting systems.
*17. Identify special starting aids that can be used with diesel engines.
*18. Test glowplugs and replace if needed.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Turner, J. Howard, and Harold E. Tiffany. Fuels and Lubricants: Selecting, Conserving, and Storing. Athens, GA: American Association for Vocational Instructional Materials. 1983. (Objectives 3-4)

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will identify the following oil ratings and classifications: SAE, API, MIL, and ASTM.
Objective 2: The student will list three characteristics described by an SAE viscosity number.
Objective 3: The student will associate three classes of C-type engine oils with their uses.
Objective 4: The student will associate three GL-type gear lubricants with their uses.
*Objective 5: The student will list four functions of the lubrication system.
*Objective 6: The student will identify five components of a typical lubrication system and state one function of each.
*Objective 7: The student will change engine oil and filter following industry accepted procedures.
*Objective 8: The student will identify nine parts of a liquid cooling system.
*Objective 9: The student will trace the flow of coolant through a liquid cooling system from the radiator through the engine and back to the radiator.
*Objective 10: The student will reverse flush a radiator and system following industry accepted procedures.
*Objective 11: The student will test thermostat action to determine if it is operating within manufacturer's specifications.
*Objective 12: The student will test for exhaust gas leakage and air in the cooling system.
*Objective 13: The student will identify four parts of an air intake system.
*Objective 14: The student will identify three types of air cleaners.
*Objective 15: The student will service an air cleaner following industry standards for the specific filter to be serviced.
*Objective 16: The student will name three types of starting systems.
*Objective 17: The student will identify five special starting aids that can be used with diesel engines.
*Objective 18: The student will test glowplugs to determine if they are meeting the manufacturer's specifications and replace if needed.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

___ 1. Identified oil ratings and classifications.
___ 2. Described the use of an SAE viscosity number.
___ 3. Associated the C-type engine oils with their uses.
___ 4. Associated the GL-type gear lubricants with their uses.

____ *5. Listed functions of the lubrication system.
____ *6. Identified the components of a typical lubrication system and stated the function of each.
____ *7. Changed engine oil and filter.
____ *8. Identified parts of a liquid cooling system.
____ *9. Traced the flow of coolant through a liquid cooling system.
____*10. Reverse flushed a radiator and system.
____*11. Tested thermostat action.
____*12. Tested for exhaust gas leakage and air in the cooling system.
____*13. Identified parts of an air intake system.
____*14. Identified types of air cleaners.
____*15. Serviced an air cleaner.
____*16. Named types of starting systems.
____*17. Identified special starting aids that can be used with diesel engines.

*Indicates core/essential objectives

DIESEL ENGINE MECHANICS II

Developed by

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DIESEL ENGINE MECHANICS II

Unit No.	Title
1	Orientation
2	Advanced Auxiliary Systems
3	Fuel Systems
4	Electrical Systems
5	Engine Performance
6	Hydraulics
7	Power Trains

COURSE: Diesel Engine Mechanics II

Unit 1: Orientation and Safety (Review and Reinforcement)

Objectives: Upon completion of this unit, the student will:

*1. Identify rules of personal safety.
*2. Identify rules of general safety.
*3. Associate safety colors with their applications.
*4. Define terms associated with hazardous materials.
*5. Identify categories of hazardous materials.
*6. State signal words or symbols that indicate how severe a hazard may be.
*7. List methods for reducing hazardous waste.
*8. Identify general procedures for storing hazardous materials and wastes.
*9. Identify and describe the informational sections found on a Material Safety Data Sheet.
*10. Describe general first aid procedures to follow in case of an accident involving hazardous materials.
*11. Identify safety equipment to be used with hazardous materials.
*12. List steps to follow in handling spills and waste disposal.
*13. Identify agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Warzecha, Mary. Hazardous Materials Fingertip Retrieval System. Alexandria, VA: American Vocational Association. 1988. (Objectives 4-13)

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify five rules of personal safety.
*Objective 2: The student will identify ten rules of general safety.
*Objective 3: The student will associate five safety colors with their applications.

*Objective 4: The student will define the following terms associated with hazardous materials: hazardous material, combustible, flammable, corrosive, reactive, E P toxic.

*Objective 5: The student will identify five categories of hazardous materials.

*Objective 6: The student will state in order the five signal words or symbols that indicate how severe a hazard may be.

*Objective 7: The student will list seven methods for reducing hazardous waste.

*Objective 8: The student will identify general procedures for storing hazardous materials and wastes including the following: (a) Make sure that all containers are properly labeled at all times, (b) Mark all containers containing hazardous waste materials with the words "HAZARDOUS WASTE" and with the date that the container was first used to store the waste, (c) Store wastes and materials as described by the manufacturer, (d) Make sure that containers are intact and secure at all times, and (e) Keep all containers closed securely except when being filled or emptied.

*Objective 9: The student will identify and describe nine sections of information found on a Material Safety Data Sheet which provide guidelines for creating a safe work environment.

*Objective 10: The student will describe the following first aid procedures to be followed in case of an accident involving hazardous materials: (a) Move the victim to fresh air, (b) Check the container label, Material Safety Data Sheet, or other source for first aid procedures and begin first aid at once, (c) Contact the person designated to help with first aid and evacuation procedures, (d) Call an ambulance, (e) Follow instructions from the designated person concerning further first aid and evacuation measures, (f) Remain with the person until the ambulance arrives, and (g) Attach a Material Safety Data Sheet or other information on the material to the person's clothing prior to transport.

*Objective 11: The student will identify seven different pieces of equipment which can be used to protect the body when working with hazardous materials.

*Objective 12: The student will list seven general steps to follow in handling spills and waste disposal.

*Objective 13: The student will identify three Federal and one State agency which should be contacted in case of an accident or to obtain more information about hazardous materials.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified rules of personal safety.
____ *2. Identified rules of general safety.
____ *3. Associated safety colors to their applications.
____ *4. Defined terms associated with hazardous materials.
____ *5. Identified categories of hazardous materials.
____ *6. Stated signal words or symbols that indicate how severe a hazard may be.
____ *7. Listed methods for reducing hazardous waste.
____ *8. Identified general procedures for storing hazardous materials and wastes.
____ *9. Identified and described the informational sections found on a Material Safety Data Sheet.
____*10. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____*11. Identified safety equipment to be used with hazardous materials.
____*12. Listed steps to follow in handling spills and waste disposal.
____*13. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics II

Unit 2: Advanced Auxiliary Systems

Objectives: Upon completion of this unit, the student will:

*1. Inspect a turbocharger for satisfactory operation.
*2. Service a turbocharger.
*3. Service and repair a roots-type blower.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will inspect a turbocharger for satisfactory operation as per manufacturer's specifications.
*Objective 2: The student will service a turbocharger following manufacturer's specifications and procedures.
*Objective 3: The student will service and repair a roots-type blower following manufacturer's specifications and procedures.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Inspected a turbocharger for satisfactory operation.
____ *2. Serviced a turbocharger.
____ *3. Serviced and repaired a roots-type blower.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics II

Unit 3: Fuel Systems

Objectives: Upon completion of this unit, the student will:

*1. State the difference in a cetane rating and an octane rating.
*2. Identify the major parts of a fuel system and state the function of each.
*3. Identify the stages of fuel filtration.
4. Identify types of fuel filters and separators which remove water and impurities from diesel fuel.
5. Describe the major types of pump and injection nozzle methods.
*6. Service a fuel filter.
*7. Remove, install, and time a distributor type injection pump.
*8. Remove, install, and time an in-line injection pump.
*9. Remove and install a unit injector.
*10. Remove; service, test, and adjust; and replace an injection nozzle.
11. Identify the different types of governors.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fuel Systems. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will state the major difference in a cetane rating and an octane rating. (Octane measures a fuel's ability to resist self-ignition; cetane measures the ability of a fuel to self-ignite.)
*Objective 2: The student will identify five major parts of a fuel injection system and state the function of each.
*Objective 3: The student will identify three stages of fuel filtration.
Objective 4: The student will identify three types of fuel filters and separators which remove water and impurities from diesel fuel.
Objective 5: The student will describe three major types of pump and injection nozzle methods.

*Objective 6: The student will service a fuel filter following industry accepted procedures for the filter to be serviced.

*Objective 7: The student will remove, re-install, and time a distributor type injection pump following manufacturer's procedures and specifications.

*Objective 8: The student will remove, reinstall, and time an in-line injection pump following manufacturer's procedures and specifications.

*Objective 9: The student will remove and install a unit injector following manufacturer's procedures and specifications.

*Objective 10: The student will remove; service, test, and adjust; and replace an injection nozzle following manufacturer's specifications.

Objective 11: The student will identify two different types of mechanical and hydraulic governors.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Stated the difference in a cetane rating and an octane rating.
____ *2. Identified the major parts of a fuel system and stated the function of each.
____ *3. Identified the stages of fuel filtration.
____ 4. Identified types of fuel filters and separators which remove water and impurities from diesel fuel.
____ 5. Described the major types of pump and injection nozzle methods.
____ *6. Serviced a fuel filter.
____ *7. Removed, installed, and timed a distributor type injection pump.
____ *8. Removed, installed, and timed an in-line injection pump.
____ *9. Removed and installed a unit injector.
____ *10. Removed; serviced, tested, and adjusted; and replaced an injection nozzle.
____ 11. Identified the different types of governors.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics II

Unit 4: Electrical Systems

Objectives: Upon completion of this unit, the student will:

*1. List safety practices for dealing with electrical systems.
*2. Identify basic electrical schematic symbols.
3. State Ohm's law formulae.
*4. List types of electrical circuits.
*5. Check voltage and continuity in a circuit.
*6. Check for a grounded circuit.
*7. List the functions of a battery.
*8. State safety rules for working with batteries.
*9. Clean and service a battery.
*10. Remove and replace a battery.
*11. Measure specific gravity.
*12. Charge a battery.
*13. Test a battery.
*14. Identify major parts of a starting circuit.
*15. Identify major parts of a starter motor.
*16. Remove and replace a starter motor.
17. Disassemble, test and repair, and reassemble a starter.
*18. Test starter circuit.
*19. Identify the components of an alternator circuit and state the function of each.
*20. Identify the major parts of an alternator.
*21. State safety rules for working with alternator circuits.
*22. Test an alternator charging circuit and regulator.
*23. Remove and replace an alternator.
24. Disassemble, test, and reassemble an alternator.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Electrical Systems. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will list nine safety practices for dealing with electrical systems.
*Objective 2: The student will identify 12 basic electrical schematic symbols.
Objective 3: The student will state Ohm's law formulae for determining volts, amps, and ohms.
*Objective 4: The student will list three types of electrical circuits.
*Objective 5: The student will check voltage and continuity in a circuit.
*Objective 6: The student will check for a grounded circuit.
*Objective 7: The student will list three functions of a battery.
*Objective 8: The student will state five safety rules for working with batteries.
*Objective 9: The student will clean and service a battery including the battery posts.
*Objective 10: The student will remove and replace a battery following industry accepted procedures.
*Objective 11: The student will measure specific gravity in a battery and determine its state of charge.
*Objective 12: The student will charge a battery to its recommended voltage rating.
*Objective 13: The student will test a battery to determine if it is within acceptable limits.
*Objective 14: The student will identify four major parts of a starting circuit.
*Objective 15: The student will identify four major parts of a starter motor.
*Objective 16: The student will remove and replace a starter motor following industry accepted practices.
Objective 17: The student will disassemble, test and repair, and reassemble a starter to manufacturer's specifications.
*Objective 18: The student will test starter circuit for voltage drop.
*Objective 19: The student will identify five components of an alternator circuit and state the function of each.
*Objective 20: The student will identify five major parts of an alternator.
*Objective 21: The student will state six safety rules for working with alternator circuits.
*Objective 22: The student will test an alternator charging circuit and regulator to determine if they are operating within manufacturer's specifications.
*Objective 23: The student will remove and replace an alternator following industry accepted procedures.

Objective 24: The student will disassemble, test, and reassemble an alternator to manufacturer's specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Listed safety practices for dealing with electrical systems.
____ *2. Identified basic electrical schematic symbols.
____ 3. Stated Ohm's law formulae.
____ *4. Listed types of electrical circuits.
____ *5. Checked voltage and continuity in a circuit.
____ *6. Checked for a grounded circuit.
____ *7. Listed the functions of a battery.
____ *8. Stated safety rules for working with batteries.
____ *9. Cleaned and serviced a battery.
____ *10. Removed and replaced a battery.
____ *11. Measured specific gravity.
____ *12. Charged a battery.
____ *13. Tested a battery.
____ *14. Identified major parts of a starting circuit.
____ *15. Identified major parts of a starter motor.
____ *16. Removed and replaced a starter motor.
____ 17. Disassembled, tested and repaired, and reassembled a starter.
____ *18. Tested starter circuit.
____ *19. Identified the components of an alternator circuit and stated the function of each.
____ *20. Identified the major parts of an alternator.
____ *21. Stated safety rules for working with alternator circuits.
____ *22. Tested an alternator charging circuit and regulator.
____ *23. Removed and replaced an alternator.
____ 24. Disassembled, tested, and reassembled an alternator.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics II

Unit 5: Engine Performance

Objectives: Upon completion of this unit, the student will:

*1. Identify test equipment and its functions.
*2. State causes of hard starting or failure to start and corrective actions.
*3. State causes of an engine's failing to come to speed and corrective actions.
*4. State causes of an engine's misfiring and corrective actions.
*5. List causes of engine knock and state corrective actions.
*6. List causes of overheating and state corrective actions.
*7. List causes of smoky exhaust and state corrective actions.
*8. List steps in diagnosing and testing an engine.
*9. Identify major checkpoints in testing an engine.
*10. List causes of a diesel engine's having a lack of power and state corrective actions.
*11. List causes of a diesel engine's using too much oil and state corrective actions.
*12. List causes of high oil pressure and state corrective actions.
*13. List causes of low oil pressure and state corrective actions.
*14. Test engine compression.
*15. Check air intake system for restrictions.
*16. Check crankcase pressure, exhaust back pressure, and air box pressure.
*17. Tune up a diesel engine.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Foutes, William. Diesel Mechanics: Fundamentals. Revised by Bill Guynes, Joe Mathis, and Marvin Kukuk. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify the following pieces of test equipment and state the purpose or use of each: cylinder compression tester, injection nozzle tester, manometer, and pyrometer.

*Objective 2: The student will state five causes of hard starting or failure to start and a corrective action for each cause.

*Objective 3: The student will state four causes of an engine's failing to come to speed and a corrective action for each cause.

*Objective 4: The student will state four causes of an engine's misfiring and a corrective action for each cause.

*Objective 5: The student will list four causes of engine knock and state a corrective action for each cause.

*Objective 6: The student will list four causes of overheating and state a corrective action for each cause.

*Objective 7: The student will list three causes of smoky exhaust and state a corrective action for each cause.

*Objective 8: The student will list five steps in order in diagnosing and testing an engine.

*Objective 9: The student will identify four major checkpoints in testing an engine.

*Objective 10: The student will list nine causes of a diesel engine's having a lack of power and state a corrective action for each cause.

*Objective 11: The student will list seven causes of a diesel engine's using too much oil and state a corrective action for each cause.

*Objective 12: The student will list three causes of high oil pressure and state a corrective action for each cause.

*Objective 13: The student will list six causes of low oil pressure and state a corrective action for each cause.

*Objective 14: The student will test engine compression to determine if it is within manufacturer's specifications.

*Objective 15: The student will check an engine air intake system for restrictions.

*Objective 16: The student will check crankcase pressure, exhaust back pressure, and air box pressure to determine if these measurements are within manufacturer's specifications.

*Objective 17: The student will tune up a diesel engine following manufacturer's specifications and recommended procedures.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

___ *1. Identified test equipment and its functions.
___ *2. Stated causes of hard starting or failure to start and corrective actions.
___ *3. Stated causes of an engine's failing to come to speed and corrective actions.

____ *4. Stated causes of an engine's misfiring and corrective actions.
____ *5. Listed causes of engine knock and stated corrective actions.
____ *6. Listed causes of overheating and stated corrective actions.
____ *7. Listed causes of smoky exhaust and stated corrective actions.
____ *8. Listed steps in diagnosing and testing an engine.
____ *9. Identified major checkpoints in testing an engine.
____*10. Listed causes of a diesel engine's having a lack of power and stated corrective actions.
____*11. Listed causes of a diesel engine's using too much oil and stated corrective actions.
____*12. Listed causes of high oil pressure and stated corrective actions.
____*13. Listed causes of low oil pressure and stated corrective actions.
____*14. Tested engine compression.
____*15. Checked air intake system for restrictions.
____*16. Checked crankcase pressure, exhaust back pressure, and air box pressure.
____*17. Tuned up a diesel engine.

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics II

Unit 6: Hydraulics

Objectives: Upon completion of this unit, the student will:

*1. Identify safety hazards when working with hydraulics.
*2. List safety practices for working on hydraulics.
*3. State functions of hydraulic fluids.
*4. State operating principles of a hydraulic press.
*5. List components of a basic hydraulic circuit.
*6. Change hydraulic fluid and filter(s).

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Decker, Robert L. Hydraulics. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1980.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify four safety hazards when working with hydraulics.
*Objective 2: The student will list four safety practices for working on hydraulics.
*Objective 3: The student will state three functions of hydraulic fluids.
*Objective 4: The student will state three operating principles of a hydraulic press.
*Objective 5: The student will list four components of a basic hydraulic circuit.
*Objective 6: The student will service a hydraulic system by changing the fluid and filter(s) following manufacturer's recommended procedures and specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

___ *1. Identified safety hazards when working with hydraulics.
___ *2. Listed safety practices for working on hydraulics.

____ *3. Stated functions of hydraulic fluids.
____ *4. Stated operating principles of a hydraulic press.
____ *5. Listed components of a basic hydraulic circuit.
____ *6. Changed hydraulic fluid and filter(s).

*Indicates core/essential objectives

COURSE: Diesel Engine Mechanics II

Unit 7: Power Trains

Objectives: Upon completion of this unit, the student will:

*1. Identify basic components of a power train and state the function of each.
2. State the sequence for the transmission of power through a power train.
*3. Identify components of a basic clutch assembly.
*4. Adjust clutch linkage free travel.

*Indicates core/essential objectives

Suggested Instructional Practices:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Kukuk, Marvin and Joe Mathis. Power Trains. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1983.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify five basic components of a power train and state the function of each.
Objective 2: The student will state the sequence for the transmission of power through a power train from the flywheel to the final drive.
*Objective 3: The student will identify six components of a basic clutch assembly.
*Objective 4: The student will adjust clutch linkage free travel to manufacturer's specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified basic components of a power train and stated the function of each.
____ 2. Stated the sequence for the transmission of power through a power train.
____ *3. Identified components of a basic clutch assembly.
____ *4. Adjusted clutch linkage free travel.

*Indicates core/essential objectives

STUDENT PERFORMANCE RECORD

DIESEL ENGINE MECHANICS

DIESEL ENGINE MECHANICS I

Student: _____

This record is provided as an alternative to the student performance records at the end of each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

Place a check by each objective the student achieved; you may wish to note the date that the student achieved the objective.

C = Core competencies.

____ 1. Identified local school and shop policies and rules.
____ 2. Listed purposes of VICA.
____ C3. Identified rules of personal safety.
____ C4. Identified rules of general safety.
____ C5. Associated safety colors to their applications.
____ C6. Defined terms associated with hazardous materials.
____ C7. Identified categories of hazardous materials.
____ C8. Stated signal words or symbols that indicate how severe a hazard may be.
____ C9. Listed methods for reducing hazardous waste.
____C10. Identified general procedures for storing hazardous materials and wastes.
____C11. Identified and described the informational sections found on a Material Safety Data Sheet.
____C12. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____C13. Identified safety equipment to be used with hazardous materials.
____C14. Listed steps to follow in handling spills and waste disposal.
____C15. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.
____C16. Identified basic hand tools used in a mechanics shop.
____C17. Demonstrated the use of a hydraulic press.
____C18. Identified typical fasteners used in diesel engines.
____C19. Identified ways that bolts and threads are measured.
____C20. Described how SAE and metric bolts are graded.
____C21. Identified special purpose nuts with locking or self-locking features.
____ 22. Listed methods used to remove a seized nut.
____C23. Cut internal threads.
____C24. Cut external threads.
____C25. Restored a damaged internal thread.
____C26. Identified tools and instruments used for measurement in diesel engine mechanics.
____C27. Read a rule.
____C28. Read a micrometer.
____C29. Converted fractions to decimal numbers.

____C30. Used an electronic calculator.
____C31. Identified the basic parts of a diesel engine and stated the function of each.
____C32. Listed the steps in the basic operation of a diesel engine.
____C33. Identified the sequence of operation of a four-stroke cycle engine.
____C34. Identified the sequence of operation of a two-stroke cycle engine.
____ 35. Stated differences in a two-stroke and four-stroke cycle engine.
____ 36. Stated characteristics of a two-stroke and four-stroke cycle engine.
____C37. Stated differences in diesel and gasoline engines.
____C38. Identified the major parts of a cylinder head assembly.
____C39. Identified primary parts of a typical valve assembly.
____C40. Serviced a cylinder head and valve assembly.
____ 41. Identified primary parts of a piston and connecting rod assembly.
____C42. Serviced a piston and connecting rod assembly.
____C43. Identified gears in a valve gear train which are marked to insure correct valve timing.
____ 44. Serviced a camshaft and gear train.
____ 45. Stated advantages of wet and dry cylinder liners.
____ 46. Listed types of crankshaft construction.
____C47. Identified the parts of a crankshaft.
____ 48. Stated effects of the arrangement of crankshaft throws.
____ 49. Identified arrangement of crankshaft throws for different multi-cylinder engines.
____ 50. Listed ways for maintaining crankshaft balance.
____C51. Stated ways that bushings and bearings are used in crankshafts.
____ 52. Identified different types of thrust bearings.
____ 53. Identified functions of a flywheel.
____C54. Serviced a crankshaft.
____ 55. Identified oil ratings and classifications.
____ 56. Described the use of an SAE viscosity number.
____ 57. Associated the C-type engine oils with their uses.
____ 58. Associated the GL-type gear lubricants with their uses.
____C59. Listed functions of the lubrication system.
____C60. Identified the components of a typical lubrication system and stated the function of each.
____C61. Changed engine oil and filter.
____C62. Identified parts of a liquid cooling system.
____C63. Traced the flow of coolant through a liquid cooling system.
____C64. Reverse flushed a radiator and system.
____C65. Tested thermostat action.
____C66. Tested for exhaust gas leakage and air in the cooling system.
____C67. Identified parts of an air intake system.
____C68. Identified types of air cleaners.
____C69. Serviced an air cleaner.
____C70. Named types of starting systems.

____C71. Identified special starting aids that can be used with diesel engines.

DIESEL ENGINE MECHANICS II

Student: _____

This record is provided as an alternative to the student performance records at the end of each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

Place a check by each objective the student achieved; you may wish to note the date that the student achieved the objective.

C = Core competencies.

____ C1. Identified rules of personal safety.
____ C2. Identified rules of general safety.
____ C3. Associated safety colors to their applications.
____ C4. Defined terms associated with hazardous materials.
____ C5. Identified categories of hazardous materials.
____ C6. Stated signal words or symbols that indicate how severe a hazard may be.
____ C7. Listed methods for reducing hazardous waste.
____ C8. Identified general procedures for storing hazardous materials and wastes.
____ C9. Identified and described the informational sections found on a Material Safety Data Sheet.
____C10. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____C11. Identified safety equipment to be used with hazardous materials.
____C12. Listed steps to follow in handling spills and waste disposal.
____C13. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.
____C14. Inspected a turbocharger for satisfactory operation.
____C15. Serviced a turbocharger.
____C16. Serviced and repaired a roots-type blower.
____C17. Stated the difference in a cetane rating and an octane rating.
____C18. Identified the major parts of a fuel system and stated the function of each.
____C19. Identified the stages of fuel filtration.
____ 20. Identified types of fuel filters and separators which remove water and impurities from diesel fuel.
____ 21. Described the major types of pump and injection nozzle methods.
____C22. Serviced a fuel filter.
____C23. Removed, installed, and timed a distributor type injection pump.
____C24. Removed, installed, and timed an in-line injection pump.
____C25. Removed and installed a unit injector.

____C26. Removed; serviced, tested, and adjusted; and replaced an injection nozzle.
____ 27. Identified the different types of governors.
____C28. Listed safety practices for dealing with electrical systems.
____C29. Identified basic electrical schematic symbols.
____ 30. Stated Ohm's law formulae.
____C31. Listed types of electrical circuits.
____C32. Checked voltage and continuity in a circuit.
____C33. Checked for a grounded circuit.
____C34. Listed the functions of a battery.
____C35. Stated safety rules for working with batteries.
____C36. Cleaned and serviced a battery.
____C37. Removed and replaced a battery.
____C38. Measured specific gravity.
____C39. Charged a battery.
____C40. Tested a battery.
____C41. Identified major parts of a starting circuit.
____C42. Identified major parts of a starter motor.
____C43. Removed and replaced a starter motor.
____ 44. Disassembled, tested and repaired, and reassembled a starter.
____C45. Tested starter circuit.
____C46. Identified the components of an alternator circuit and stated the function of each.
____C47. Identified the major parts of an alternator.
____C48. Stated safety rules for working with alternator circuits.
____C49. Tested an alternator charging circuit and regulator.
____C50. Removed and replaced an alternator.
____ 51. Disassembled, tested, and reassembled an alternator.
____C52. Identified test equipment and its functions.
____C53. Stated causes of hard starting or failure to start and corrective actions.
____C54. Stated causes of an engine's failing to come to speed and corrective actions.
____C55. Stated causes of an engine's misfiring and corrective actions.
____C56. Listed causes of engine knock and stated corrective actions.
____C57. Listed causes of overheating and stated corrective actions.
____C58. Listed causes of smoky exhaust and stated corrective actions.
____C59. Listed steps in diagnosing and testing an engine.
____C60. Identified major checkpoints in testing an engine.
____C61. Listed causes of a diesel engine's having a lack of power and stated corrective actions.
____C62. Listed causes of a diesel engine's using too much oil and stated corrective actions.
____C63. Listed causes of high oil pressure and stated corrective actions.
____C64. Listed causes of low oil pressure and stated corrective actions.

____C65. Tested engine compression.
____C66. Checked air intake system for restrictions.
____C67. Checked crankcase pressure, exhaust back pressure, and air box pressure.
____C68. Tuned up a diesel engine.
____C69. Identified safety hazards when working with hydraulics.
____C70. Listed safety practices for working on hydraulics.
____C71. Stated functions of hydraulic fluids.
____C72. Stated operating principles of a hydraulic press.
____C73. Listed components of a basic hydraulic circuit.
____C74. Changed hydraulic fluid and filter(s).
____C75. Identified basic components of a power train and stated the function of each.
____ 76. Stated the sequence for the transmission of power through a power train.
____C77. Identified components of a basic clutch assembly.
____C78. Adjusted clutch linkage free travel.